REMARKS

This response is accompanied by Request for A Three-Month Extension of Time and the necessary fee to extend the date for response until Monday, February 3, 2003.

¶1-2. The drawings have been objected to under 37 CFR 1.83(b) as being incomplete. In response to this objection, the capillary structure has been designated as "5a" in Figures 1 and 5 and "16" in Figures 2-3 and 5. Figures 2-3 and 5 now include similar cross-hatching within loop 10 of generator 2 to indicate that similar capillary structure is used in these additional embodiments of the process of the present invention. It is well within the capabilities of one skilled in the art to select the proper capillary structure depending on the working liquid medium that is being absorbed. In addition, the wall of the heat pipe has been giving the number 20 in Figures 1-5. New Figures 4-5 have been added to provide respective isometric views of the embodiments of the process of the present invention using the devices shown in Figures 1-2. Figures 4-5 contains only those elements respectively shown in Figures 1-2 and do not contain any new matter.

¶3. The application has been objected under 37 CFR 1. 71(b) for failure to include an abstract. The Abstract was originally filed as page 2 of the specification. It has now been placed after the claims on a separate page. In addition, the specification has been objected to as not following the standard headings as provided in 37 CFR 1. 77(b). The specification has now been amended to include the standard headings as requested by the Examiner to overcome this objection.

¶4. The disclosure of the process of the present invention has been objected under 37 CFR 1. 71 as being incomprehensible. This objection is the result of the fact that the disclosure is simply someone's attempt to prepare a literal translation into English of the German language of the parent application as the Examiner noted in connection with the rejection of original claims 1-6. The specification has now been amended to refine the English translation with care to avoid any introduction of new matter into the text. In this original translation, "Wärmerohr" was incorrectly translated as "heat tube." The correct translation is "heat pipe." As a result of this incorrect translation, the entire disclosure became incomprehensible since heat tube has no recognized meaning in the art to which the process of the present invention is directed. On the

other hand, heat pipe is universally recognized by all those skilled in the art.

This Amendment is accompanied by a page containing an English translation of a description of "Wärmerohr" from a German technical encyclopedia. The description includes a drawing that shows the mechanics of a heat pipe. It is clear from this translation, that the term "vaporize" is broad enough to include the term "evaporate." In other words, a heat pipe is functional so long as the liquid used in the heat pipe readily evaporates at the external temperatures supplied to the heat pipe by the thermal energy source. There is no need to use the boiling point of such liquids. This reference also makes it clear that the two phase transfer of evaporation and condensation of the heat pipe leads to the "formation of a high speed gas flow from the vaporizer into the condenser." This is the high speed gas flow that is the energy source that drives the gasdynamic electrostatic generator used in the process of the present invention.

Another reference to obtain an instant understanding of heat pipes is the article entitled "What is a Heat Pipe?" located on the Web at http://www.cheresources.com/htpipes.shtml. A copy of this article accompanies this Amendment.

The Primary Examiner objected to the previous translation as not defining the following items:

(1) The source of the energy of the device operation. The foregoing amendment now makes it clear that the source of the thermal energy for operating the heat pipe can be a heater. However, the most practical source is the solar energy.

(2) The source of the liquid for the heat pipe. This is understood to mean any of the working fluids common in heat pipes after taking into consideration the source of thermal energy. For example, if solar energy were the source, one skilled in the art may reasonably select one of the following fluids as set forth in the table on page 4 of the article entitled "What is a Heat Pipe?": acetone, methanol, ethanol, and Flutec PP2 (Perfluorocarbon that is predominantly perfluoromethylcyclohexane). All of these liquids readily evaporate at low temperatures in the vaporizer section and rapidly condense at a very small temperature difference in the condenser section of the heat pipe.

(3) The structure of the tubes. This refers to the structure of the heat pipe, which in general is shown on page 6 of the article entitled "What is a Heat Pipe?" However,

Figures 1-5 show the structure for the heat pipe for use in accordance with the presently claimed process.

(4) The external forces. External forces, which are moving working media in any gasdynamic electrostatic generator, are gas flow forces. The only external forces referred to in the originally filed application are the heat pipe's gas flow forces.

(5) The "properties of the heat tubes." In view of the foregoing remarks, it is understood that the properties of the heat pipe are well known to one skilled in the art. This is especially true in view of the specification that has now been amended to refer to heat pipes rather than the incorrectly translated "heat tubes."

Accordingly, the Applicants believe have clarified the originally filed disclosure with the foregoing amendments and remarks to enable the Primary Examiner to make a proper comparison of the presently claimed invention with the prior art.

¶5. A new title of the invention has been added to remove this objection.

¶6-7. Claims 1-6 stand rejected under 35 U.S. C. 112, first paragraph for failure to describe the best mode. This rejection has been overcome by the addition of new claims 7-15 that define the best mode contemplated by the inventors at the time they filed the original German patent application on October 22, 1998. The apparent reason for this rejection is the fact that the translation of the original specification contained an error in using the phrase "heat tube" in place of "heat pipe" as discussed in the above remarks.

¶8. The specification has been objected to under 37 CFR 1.71. This objection has been removed by retranslating the entire specification from its original German to English with the understanding that no new matter can be added.

¶9-12. Claims 1-6 stand rejected under 35 U.S. C. 112, second paragraph. This rejection has been overcome by the addition of new independent claim 7 and dependent claims 8-15 that have been written to conform to current U.S. practice.

¶13. The prior art has been made of record and has not been relied upon. However, the Applicants have review this prior art and believe that the presently claimed invention is inventively and patentably distinguishable from all such prior art. To the Applicants knowledge, they are the first to combine a heat pipe with an electrostatic generator for the purpose of supplying the electrostatic generator with the mechanical energy of heat pipe gas flow and for

producing, in this way, electrical energy from any source of thermal energy including solar energy

¶14. The following table details the support for the claims:

Claims	Support In Original Specification
7. A process for producing electrical energy from thermal	Pg. 1, line 4 & page 3, line 3
energy comprising the steps of:	
supplying thermal energy to a heat pipe containing a	Pg. 5, line 5 & Fig. 1
working fluid and a capillary insert to evaporate the working	Pg. 4, lines 6-9 & Fig. 1
fluid in a vaporizer section of the heat pipe;	Pg. 4, lines 14-16 & Fig. 1
directing the resulting vapor flow through the heat pipe	Pg. 4, lines 14-16 & Fig. 1
to a condenser section of the heat pipe where the vapor is	Pg. 4, lines 14-16 & Fig. 1
condensed and the resulting condensate returns to the vaporizer	Pg. 4, lines 14-16 & Fig. 1
section via the capillary insert;	Pg. 4, lines 16-16 & Fig. 1
entraining liquid droplets of an electrostatic generator	Pg. 5, lines 16-19 & Fig. 1
by means of the vapor flow from the vaporizer section of the	Pg. 5, lines 16-19 & Fig. 1
heat pipe, the electrostatic generator having a liquid working	Pg. 4, lines 9-12 & Fig. 1
medium to supply the liquid droplets, a solid working medium	Pg. 4, lines 9-12 & Fig. 1
for charges separation, and a pick-up electrode within the	Pg. 4, lines 9-12 & Fig. 1
condenser section of the heat pipe;	Pg. 4, lines 9-12 & Fig. 1
passing the vapor entrained with the liquid droplets by	Pg. 5, lines 16-19, & claim 2
the solid working medium to cause separation of the	Pg. 5, lines 9-19, & Fig. 1
electrostatic charges between the solid and liquid working	Pg. 5, lines 9-19 & Fig. 1
media;	
displacing of the resulting charged liquid droplets-	Pg. 5, lines 5-19 & Fig. 1
working medium under the action of external forces caused by	Pg. 5, lines 5-19 & Fig. 1
the kinetic energy of the molecules of the vapor flow, wherein	Pg. 5, lines 5-19 & Fig. 1
the external forces perform work against the Coulomb forces;	Pg. 1, lines 4-12 & Fig. 1
and	

passing the liquid droplets-working medium past the pick-up electrode to pick up electric charges that are mechanically displaced by the external forces against the Coulomb forces to generate electrical energy from the thermal energy.	Pg. 5, lines 5-19 & Fig. 1 Pg. 5, lines 5-19 & Fig. 1 Pg. 5, lines 5-19 & Fig. 1 Pg. 1, lines 4-12 & Fig. 1
8. The process of claim 7, wherein said electrostatic generator also has a first external electrode connected to said solid working medium and a second external electrode connected to said pick-up electrode.	Pg. 4, lines 9-12, pg. 5, lines 21-23 & Fig. 1
9. The process of claim 8, wherein the pick-up electrode is a grid	Pg. 5, lines 29-30 & Fig. 1
10. The process of claim 9, wherein the solid working medium comprises a second grid through which the vapor entrained with liquid droplets passes.	Pg. 6, lines 1-3, Fig. 3 & claim 3
11. The process of claim 7, wherein a diaphragm of separates the vaporizer section from the condenser section to create an area of maximum flow velocity.	Pg. 5, lines 9-14 & Fig. 1
12. The process of claim 11, wherein the solid working medium is located within the heat pipe roughly at the position of the maximum flow velocity.	Pg. 5, lines 9-14,Fig. 11 & claim 4
13. The process of claim 7, wherein the liquid droplets are recovered and fall by gravity into a loop return and are returned to be entrained by means of the vapor.	Pg. 4, lines 9-12 & Fig. 1

14. The process of claim 7, wherein the liquid droplets are recovered through a loop return containing a capillary insert and are returned to be retained by means of the vapor.	Pg. 5, lines 25-29 & Fig. 2 Pg. 5, lines 25-29 & Fig. 2.
15. The process of claim 7, wherein the same liquid is used as the fluid in the heat pipe and the working liquid medium of the generator.	Pg. 6, lines 21-23 & claim 6
16. The process of claim 7, wherein the thermal energy is solar energy.	Pg. 1, line 12

In view of the foregoing amendments and remarks, the Primary Examiner's objections to the drawings, the specification, and the abstract have been removed and rejection of the claims have been overcome. New Claims 7-16 are now believed to be in a condition further examination. If the Examiner has any question concerning this amendment, please contact the undersigned attorney.

Respectfully submitted,

Richard A. Dannells

Richard A. Dannells
Registration No. 22,654

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COUDERT BROTHERS LLP
600 Beach Street, 3rd Floor
San Francisco, CA 94109
Telephone: (415) 409-2900
Telefax: (415) 409-7400

VERSION WITH MARKINGS TO SHOW CHANGES

In the Specification:

The specification beginning on page 1, line 1 through page 6, line 23, as originally filed, have been amended with slight modifications to the paragraph originally appearing on page 1, lines 4-12 being inserted after the first paragraph of the Summary of the Invention. The added words have been underlined and the deleted words have been surrounded by brackets:

[METHOD FOR PRODUCING ELECTRICAL ENERGY]

[A method for producing electrical energy in which charges are separated between two working media triboelectrically or electrostatically, the charges are moved away from one another by displacement of the working media under the action of external forces, here the external forces perform work against the Coulomb force, and the charges are routed onto electrodes, the indicated process steps being carried out within the inside volume of a heat tube, charge separation and charge displacement taking place using the directed gas flow of the heat tube, which flow entrains one working medium and routes it past the other working medium for charge separation and displacement. Application use of solar energy]

<u>ELECTROGASDYANAMIC METHOD FOR GENERATION ELECTRICAL ENERGY</u>

<u>CROSS-REFERENCE TO RELATED APPLICATION</u>

<u>This application claims priority benefits under Title 35, U.S. Code §119 to PCT/DE99/03389 filed October 21, 1999, published as WIPO Publication No. WO 00/25414 on May 4, 2000, which claims the priority benefits to German Patent Application DE 198 48 852.1, filed October 22, 1998, now granted as European Patent No. EP 1123578 on August 28, 2002 for the following 19 Countries: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LI, LU, MC, NL, PT, SE.</u>

<u>STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT</u>

<u>Not Applicable</u>

<u>REFERENCE TO A "MICROFICHE APPENDIX"</u>

Not Applicable

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to a [A] process [is known] for generating [high DC] voltages by mechanical displacement of electrical charges. More particularly, [In doing so] the charges between two working media are separated by triboelectrification or by induced static electricity [electrization], one of the two media being electrically connected to an electrode and the second working medium being transferred to another electrode on which the charge is picked up.

(2) Description of Related Art

[Accordingly the second working medium is transferred to another electrode on which the charge is picked up.] Devices used in the process of the present invention [The described process is carried out in devices which] are called electrostatic generators (] ; see DE 23 36 487 A1 [,] and European Patent Application 0229 843 A1 [)] for a description of a prior art electrostatic generator.

A process is known for producing electrical energy by friction of certain stiff dielectric surfaces consisting of different materials against one another, and it is accomplished in a compact device; [(] see European Patent Application 0366591 A1[)].

The prior art [cited] devices which can be used for carrying out the present invention [accomplish the known processes] are characterized by the possibility of generating electrical high voltage (up to 15 20 MV), by a low current (up to 10 mA), therefore also by low power. The power of these devices is limited on the one hand by the maximum allowable surface density of charges on a conveyor, the carrier of the charge, on the one hand, and by the speed of mechanical movement of this charge conveyor.

The charge density for its part is limited by the formation of an electrical discharge on the dielectric surface. The speed of the charge conveyor is limited by the mechanical motion possibilities of the [system] parts of the prior art devices.

The efficiency of [the] these prior art [system is] devices are determined mainly by the

aerodynamic losses as the charge conveyor is moved mechanically and by the friction of the mechanical system parts among one another. In existing prior art devices this is not greater than 15-20%.

SUMMARY OF THE INVENTION

The object of the process of the presently claimed invention [which is given in claims [1-6] is to increase the power and the efficiency of the prior art devices [which implement the described process] and to enable conversion of the thermal energy into electrical energy.

[This object is achieved by the features listed in claims 1 5.]

In the process of the present invention for producing electrical energy, charges are separated between two working media triboelectrically or electrostatically in an electrostatic generator and are moved away from one another by displacement of the working media under the action of external gas flow forces. The external forces perform work against the Coulomb force, and the charges are routed onto electrodes. The process steps are carried out within the inside volume of a heat pipe with the charge separation and charge displacement taking place using the directed gas flow of the heat pipe. The gas flow entrains one working medium of the electrostatic generator and routes it past the other working medium for charge separation and displacement. One source of the thermal energy is the use of solar energy.

The advantages which are achieved with the process of the present invention consist especially in [that the indicated process enables] enabling the use of thermal energy of any heater for its direct conversion into electrical energy, high output power and high efficiency.

As a result of the properties of [the] heat pipes [tubes], a relatively small temperature difference between vaporizer and condenser sections [the heater and cooler] is sufficient to achieve a high flow velocity of the gaseous working medium of the heat pipes [tubes] and consequently also high kinetic energy. By means of this kinetic energy, the indicated flow causes electrostatic electrification [triboelectrification] of the working media of the electrostatic generator and mechanical displacement [separation] of charges. In the devices which implement this process thus there are no mechanically moving parts, for which reason all losses of power and efficiency which occur for this reason are prevented. Moreover, in this case drive does not

take place by external mechanical work, but by thermal energy which can even be removed from a small temperature difference.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The embodiments of the process are shown in the drawings and are detailed below.

Figure 1 shows an embodiment of the process of the present invention using [in] a fixed device with its indicated orientation in the gravitational field.

Figure 2 shows an embodiment of the process of the present invention using [in] a device which can function at different orientations, in a gravitational field, and also in weightlessness.

Figure 3 shows an embodiment of the process of the present invention in which the working liquid of an [the] electrostatic generator is not electrified at the site of its detachment from the mouth of a [the] feeder nozzle, but at some distance from it by the breakdown of the liquid droplets when they suddenly encounter the grid.

Figure 4 shows an isometric view of the embodiment shown in Figure 1.

Figure 5 shows an isometric view of the embodiment shown in Figure 2.

DETAILED DESCRIPTION OF THE INVENTION

All types of devices for enablement of [which enable] the process of the present invention contain a heat pipe 1 [tube 1] [(WR)] and a generator 2. The heat pipe 1 [tube 1] has a [the] working medium in the liquid phase, i.e., [(] the working liquid 3 [of the heat tube 3 and in] which is vaporized to the gaseous phase, i.e., [(] the working gas 4 [of the heat tube], and a capillary insert 5 [of the heat tube]. The generator 2 contains the solid working medium 6 of the generator 2 [6], the liquid working medium 7 of the generator 2 [7], the pick-up electrode (grid) 8 [the grid] for charge pick-up [8], the external electrodes 9a and 9b and the loop 10 for return of the liquid working medium 7.

When an external temperature gradient builds up between the vaporizer 11 and the condenser 12 of the heat pipe 1, [tube12] the working liquid 3 of the heat pipe [tube], vaporizes in the vaporizer on its capillary structure 5a. At the same time the working gas 4 of the heat pipe 1 [tube] condenses on [a] the capillary structure 5a of the capillary insert 5 of the condenser 12 of

the heat pipe 1 [tube]. The working liquid 3 travels via the capillary insert 5 out of the condenser 12 back into the vaporizer 11.

It is necessary [sufficient] for the operation [continuation] of the process of the present invention that the latent heat of vaporization in the first phase of the process [former case] is supplied to the working liquid 3 [medium] in vaporizer 11 of the heat pipe [tube] and the resulting working vapor is removed from vaporizer 11 and flows to condenser 12 during the second phase [in the latter case is removed]. [Therefore this] This process can also be carried out at a very small temperature difference.

[Here the] The volume of the working liquid 3 [medium] of the heat pipe [tube] in the vaporizer 11 increases suddenly and as a result the pressure of the working gas 4 in the vaporizer 11 does likewise. The volume [of the working medium] and the pressure of the working gas 4 of the heat pipe [tube] in the condenser 12 decrease equally suddenly.

Thus, for [at] a small temperature difference in a closed space during the two phases of the process, [processes of] the increase and decrease of the gas pressure take place simultaneously and uninterruptedly in this [a] closed space; these phases of the process [processes] are spatially separated [distributed in space], proceed with different signs, and are explosive according to their physical properties. This leads to formation of a high speed gas flow from the vaporizer into the condenser. In doing so, the thermal energy which is supplied to the heat pipe [tube] is converted into kinetic energy of the molecules of the gas flow and can be converted further into other types of energy, for example, into electrical energy.

The solid working medium 6 and the liquid working medium 7 of the generator 2 are accommodated within the heat pipe 1 [tube], roughly at the location of the maximum flow of the working gas 4 of the heat pipe [tube], directly behind the diaphragm 13. The diaphragm 13 concentrates the gas flow from the vaporizer 11 into the condenser 12. [In doing to the] The solid working medium 6 is fixedly attached [stationary] with respect to the heat pipe [tube] and is connected to electrode 9b.

The liquid working medium 7 is supplied to the interior of the heat pipe [tube] via the feeder 14, charge separation and charge displacement taking place using the directed gas flow of the heat pipe [tube], which flow entrains liquid droplets [particles} and routes them past the other working medium 6 resulting in [for] charge separation and displacement.

Subsequently the charge is picked up on the external electrode 9a <u>connected to grid 8</u>, quite analogously to the manner in which this takes place in electrostatic generators with solid media.

In one version of <u>operating the process of the present invention shown in Figures 2 and 5,</u> [process execution (Figure 2)] the loop 10 for return of the liquid working medium 7 of the generator <u>2</u> is filled with a capillary structure <u>16</u>. This makes it possible for the device to work regardless of its location in the gravitational field, and also in weightlessness. Here the open surface of the aforementioned capillary structure <u>16</u> is housed directly behind the grid of the pick-up electrode 8.

In the embodiments of other versions of the process <u>of the present invention shown in Figures 3,</u> [(Figure 3)] charge separation takes place by the liquid 7 striking the medium 6. Here the medium 6 has the shape of for example a grid. In this case the solid working medium <u>6</u> is <u>located</u> [moved] at some distance [1] from the insertion site of the feeder 14 into the interior of the heat <u>pipe</u> [tube] <u>as shown in Figure 3</u>. The droplets of the medium 7 before striking the medium 6 acquire a certain kinetic energy which is expended for charge separation. After impact the charged droplets are carried on further with the gas flow of the heat <u>pipe</u> [tube] 4 to the <u>pick-up</u> electrode 8.

The gases which are not condensing and which remain in the heat <u>pipe</u> [tube] (for example, air and also vapors of the working liquid <u>7</u> of the generator <u>2</u>, which in a closed space, are inevitably <u>combined with</u> [joined to] the liquid 7, which has a free surface) are pushed away by the working gas <u>4</u> of the heat <u>pipe</u> [tube] to one of the ends of the <u>pipe</u> [tube] in the first seconds of operation of the heat <u>pipe</u> [tube], and form a gas cushion 15.

In the geometry of the heat <u>pipe</u> [tube] and the electrode <u>8</u> for the charge pick-up [8] (Figures 1-<u>5</u>[3])<u>,</u> this gas cushion <u>15</u> to a certain extent thermally insulates the pick-up electrode 8 and the wall 20 of the heat <u>pipe</u> [tube] adjoining it. Therefore<u>,</u> the temperature of the <u>pick-up</u> electrode <u>8</u> generally differs from the temperature of the capillary structure <u>5a</u> of the condenser <u>12</u> of the heat <u>pipe</u> [tube].

Since the insertion site of the feeder 14 into the heat <u>pipe</u> [tube] is outside of the vaporizer 11, the same liquid can be used <u>for</u> [as] the working liquid of the heat pipe and of the generator.

In the Claims:

Claims 1-6 have been deleted and the following claims have been added:

7. A process for producing electrical energy from thermal energy comprising the steps of:

supplying thermal energy to a heat pipe containing a working fluid and a capillary insert to evaporate the working fluid in a vaporizer section of the heat pipe;

directing the resulting vapor flow through the heat pipe to a condenser section of the heat pipe where the vapor is condensed and the resulting condensate returns to the vaporizer section via the capillary insert;

entraining liquid droplets of an electrostatic generator by means of the vapor flow from the vaporizer section of the heat pipe, the electrostatic generator having a liquid working medium to supply the liquid droplets, a solid working medium for charges separation, and a pick-up electrode within the condenser section of the heat pipe;

passing the vapor entrained with the liquid droplets by the solid working medium to cause separation of the electrostatic charges between the solid and liquid working media;

displacing of the resulting charged liquid droplets-working medium under the action of external forces caused by the kinetic energy of the molecules of the vapor flow, wherein the external forces perform work against the Coulomb forces; and

passing the liquid droplets-working medium past the pick-up electrode to pick up electric charges that are mechanically displaced by the external forces against the Coulomb forces to generate electrical energy from the thermal energy.

8. The process of claim 7, wherein said electrostatic generator also has a first external electrode connected to said solid working medium and a second external electrode connected to said pick-up electrode.

9. The process of claim 8, wherein the pick-up electrode is a grid.

10. The process of claim 9, wherein the solid working medium comprises a second grid through which the vapor entrained with liquid droplets passes.

11. The process of claim 7, wherein a diaphragm of separates the vaporizer section from the condenser section to create an area of maximum flow velocity.

12. The process of claim 11, wherein the solid working medium is located within the heat pipe substantially at the position of the maximum flow velocity.

13. The process of claim 7, wherein the liquid droplets are recovered and fall by gravity into a loop return and are returned to be entrained by means of the vapor.

14. The process of claim 7, wherein the liquid droplets are recovered through a loop return containing a capillary insert and are returned to be retained by means of the vapor.

15. The process of claim 7, wherein the same liquid is used as the fluid in the heat pipe and as the working liquid medium of the generator.

16. The process of claim 7, wherein the thermal energy is solar energy.

In the Abstract:

The following abstract has been added as the last page after the claims:

ELECTROGASDYANAMIC METHOD FOR GENERATION ELECTRICAL ENERGY

Abstract of the Disclosure

A process is provided for producing electrical energy from thermal energy in which charges are separated between two working media triboelectrically or electrostatically, the charges are moved away from one another by displacement of the working media under the action of external gas flow forces. In the process, these external forces perform work against the Coulomb forces, and the charges are routed onto electrodes. The process steps are carried out within the inside volume of a heat pipe, with charge separation and charge displacement taking place using the directed gas flow within the heat pipe. The gas flow entrains a liquid medium and routes it past the other working medium for charge separation and displacement. An application of the present invention is in the use of solar energy.

In the Drawings:

Figures 1-3 as originally filed have been replaced by the accompanying Figures 1-5.